

USER INTERFACE FOR SELECTING DESTINATIONS BY ADDRESS IN
A VEHICLE NAVIGATION SYSTEM

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10 **Field of the Invention**

The present invention relates to a user interface for a vehicle navigation system, more particularly, to a user interface for identifying and displaying destination addresses.

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Description of the Related Art

Vehicle navigation systems are well known, see e.g. Yamada et al., U.S. Patent No. 4,926,336; Link et al., U.S. Patent No. 5,270,937; and Ichikawa, U.S. Patent No. 20 5,410,485, all incorporated by reference. Such navigation systems generally perform two major functions. One function is to identify the optimum route from the present location to a desired destination, a process which is generally referred to as route 25 guidance. The other function is to display a map of both the present location and of the identified route. This display is usually in the form of a map displayed on a small screen installed in the vehicle.

As is well known, typically in such systems a 30 database is provided of the road network. This database

lists all of the roads for instance in one state or in some other fairly large geographical area. This representation of the road network is sometimes referred to as a digitized map.

5 The navigation apparatus of the type used in the
U.S.A. displays guidance pictures during navigation. It
detects the position of the vehicle, reads out map data
corresponding to the vehicle position from a map data
base such as a CD-ROM, displays, by using map data, an
10 enlarged diagram of an approached intersection or a
branching point, which may exist in a guide route in a
predetermined distance range from the present vehicle
position, along with an arrow indicating a heading
direction and performs speech guidance by designating
15 the heading direction.

To perform its above mentioned functions, current navigation systems require a user to first identify the city name followed by the street base name. After the selection of the street name, the system displays a list of all possible road types, suffixes or prefixes that in conjunction with the selected full street name constitute valid addresses. At this point the user must select a road type from the list, subsequent to which the user must enter the house number of his desired destination. If the house number does not fall within a valid range of the house numbers for the selected street, the user must select another road type from the displayed list and repeat the process until the selected house number exists on the selected street.

The following example further illustrates this point:

Example 1

100 Main St

5 Los Angeles, CA

To select the above address, a user must first enter the city name "Torrance" and then enter the street base name "Main", after which the system perform a search of its
10 database and identifies and generates a list of all possible road types that in conjunction with the street name "Main" constitute valid addresses. Let's assume that the system identifies and displays the following three combinations of the valid road types and the
15 street base name "Main" for the city of "Torrance":

Main St

Main Pl

Main Ave

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Let's assume that the user selects "Main Pl" from the above list. The user must now enter the house number "100" after which the system performs a search of its map database to identify the desired location. If house
25 number "100" does not exist in "Main Pl", the user must go back and select another road type for the street name "Main".

As is evident from the above examples, a disadvantage of many present navigation systems is that
30 they require a user to know the complete address of the

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desired destination, including the road type ("Pl") and any prefix and/or any suffix associated with a street base name. Should a user fail to recall any component of an address, e.g. "St" of the above example 1, the user
5 must guess that component; this is likely to lead to inefficiency and inconvenience.

Therefore, a need has arisen for a navigation system that is more flexible and can aid a user to identify all the components of an address, e.g. the road
10 type and any prefix and/or a suffix associated with that address, more efficiently.

Summary

In accordance with the present invention, a vehicle
15 (or other) navigation system (i.e. mapping system) performs a search of its map database to identify and display a list of all addresses therein which contain address components in conformity with the user provided "city name", "street base name" and "house number", and
20 prompts the user to select an address from the displayed list. Alternatively, the system allows the user to enter only a "street base name" and a "house number", forms the combination therefrom, whereby the system finds all possible city names containing that combination and
25 subsequently generates and displays a list of the city names thus found. After the user selects a city name from the list, the system displays a second list containing all addresses in its database having components matching those entered/selected by the user



and prompts the user to select an address from the second list.

Advantageously, in accordance with the present invention, the vehicle navigation system provides a substantially reduced list of possible valid addresses by requiring the user to select the road type and any prefixes/suffixes associated with the user's desired address at the final stages of the address selection process.

Brief Description of the Drawings

Fig. 1 shows a flowchart which delineates the sequence of steps performed by the navigation system to help a user identify the desired destination.

Figs. 2A and 2B illustrate the sequence of screens displayed to help a user identify a desired destination as in Fig. 1.

Detailed Description

The names, numbers and other information, which in the aggregate conventionally constitute a street address, are hereafter referred to as address select components. In the discussion below it is understood that address select components conventionally include a house number, a street base name, a prefix which is a string of alphabetic character(s) preceding the street base name, a suffix which is a string of alphabetic character(s) succeeding the street base name, a road type and a city name.



Examples of the prefixes/suffixes recognized by the navigation system in accordance with the present invention, and which are of the type most commonly used in the United States are: "E", "N", "S", "W", "NE",
5 "NW", "SE" and "SW".

Examples of the road types recognized by the navigation system and which are of the type most commonly used in the United States are: "St", "Ave", "Pl", "Blvd", "Rd" and "Dr". A street base name refers
10 to the name of the street on which the desired destination (house, business, etc.) is located. For instance, the street base name of the following address is "Gramercy".

15 19145 Gramercy Pl
Torrance, CA

In accordance with the present invention, the navigation system helps a user fully identify a desired
20 address according to one of the following two sequences:

1. City Name
2. Street Base Name
3. House Number
4. Road type and Affix (prefix/suffix)

25 or

1. Street Base Name
2. House Number
3. City Name
4. Road type and Affix (prefix/suffix)

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Fig. 1 shows a flowchart which delineates the sequence of steps performed by the navigation system to help a user identify the desired destination. In Fig. 1, the rectangular boxes designate system prompts or display stages and the diamond boxes designate decision points.

As can be seen from Fig. 1, the system, after a user activates the navigation system to find his destination, presents the user with an option to commence the address selection process, shown in the flowchart by decision point 10, by either entering a city name, path 12, or entering a street name, path 20. If the user knows the city name of his destination, the user chooses path 12 after which the system prompts the user to enter the "City Name", the "Street Base Name" and the "House Number" at steps 14, 16 and 18 respectively. Subsequently, at decision point 30, the system initiates a search of its conventional map database to identify all valid addresses therein that are an aggregation of the user provided "City Name", "Street Base Name" and "House Number" with the system known road types and road affixes. If the database search finds only one identifiable address, the system displays and selects that address and prompts the user to initiate the conventional route guidance to that address at step 34. If the database search finds more than one valid address, the system displays on its display screen a list of all fully identified addresses and prompts the user to select (using the keypad) an address from the list generated at step 32. Each address

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listed in step 32 is fully identified and includes all the address select components, including a valid road type and any road affixes associated with that address. After the user selects an address at step 32, the system
5 moves to step 34, the operation of which is conventional and discussed earlier.

A user may not know or remember the city name of his desired destination. To accommodate such users, the system provides an alternative choice, path 20, at step
10 10 to help a user identify the name of his/her desired city. If path 20 is chosen, the user is prompted to enter the "Street Base Name" and the "House Number" at steps 22 and 24, respectively. At decision point 26, the system performs a search of its database to identify all
15 possible cities that include the user provided "Street Base Name" and "House Number". If the search identifies a plurality of city names in conformity with the above characteristics, the system displays a list of the city names and prompts the user to select a city name from
20 the list thus found at step 28. After the user's selection of a city name at step 28, the system enters step 30 to continue the address selection process, as described earlier. If the search conducted at step 26 finds only one identifiable city, the system
25 automatically selects that city and moves to step 30.

The following example further illustrates how the user interface, in accordance with the present invention, aids a user to identify an address. In this example, it is assumed that a user does not recall the
30 road type "Pl" of his desired destination which is:

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19145 Gramercy Pl
Torrance CA

5 After the user presses the "menu" key located on the
navigation system remote hand held unit, the system
displays for the user conventionally a menu of options
to help the user find his/her desired destination, as
shown at stage 42 of Fig. 2A. The user selects the
10 option "Address", as designated by the highlighted area,
from the displayed menu to initiate an address selection
process. At stage 44, corresponding to decision point 10
in the flowchart of Fig. 1, the system prompts the user
to choose either a city name or a street base name as
15 the starting point of the address selection process. The
user responds by selecting the option "City Name", as is
designated by the highlighted area.

At stage 46, corresponding to step 14 in the flowchart
of Fig. 1, the "Select City Name" input screen appears
20 and the user selects letters from the keypad to enter
the desired city name. Each time the user inputs an
alphabetic character as a part of the desired city name,
a list displaying cities with names containing those
characters is updated in alphabetical order. The user
25 selects the city name "Torrance" from the updated list
at stage 46, as shown by the highlighted area. At stage
48, corresponding to step 16 in the flowchart of Fig. 1,
the "Input Street Name" input screen appears and the
user selects letters from the keypad to enter the
30 desired street name. Each time the user inputs an

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alphabetic character as a part of the desired street name, a list displaying streets with names containing those characters is updated in alphabetical order. This list only contains street base names, excluding any affixes or road types. The user can scroll up or down the list provided by the system, from which the user selects the desired street base name "Gramercy", as is shown by the highlighted area at stage 48 of Fig. 2A. Referring to Fig. 2B, at stage 50, corresponding to step 18 in the flowchart of Fig. 1, the "Input Address Number" input screen appears and the user, using the keypad, enters the desired house number "100" and presses the keypad key "Done." The house number must fall in the displayed range.

With this information, (corresponding to decision point 30 in the flowchart of Fig. 1) the system initiates a search of its map database to identify all possible road affixes, and road types that, in combination with the city name "Torrance", the street base name "Gramercy" and the house number "100", constitute valid addresses. At stage 52, corresponding to step 32 in the flowchart of Fig. 1, the system displays all such valid addresses from which the user selects his desired. As can be seen from stage 52, the address select components responsible for distinguishing the three possible addresses in this example are the road types and the prefixes. At stage 54, the complete address has been identified and the user must press the "OK to PROCEED" key on the keypad to initiate the route guidance process (corresponding to step 34 of the

flowchart in the Fig. 1) If, based on the user provided inputs, a search of the system database finds only one valid address, the system automatically selects and displays that address, highlights the "OK to PROCEED" key, and prompts the user to initiate the thereafter conventional route guidance process to that address, as shown in stage 56 of the Fig. 2B, corresponding to step 34 in the flowchart of Fig 1.

Therefore, the user interface, in accordance with the present invention, advantageously allows a user to identify the road type and the road affixes associated with his/her desired destination address at the final stage of the address selection process. The navigation system performs a much narrowed database search and eliminates the number of iterations that a user must go through in order to fully identify his/her desired address.

The present invention is included in a computer software (code) operating on the microprocessor in the system. The actual computer software code is not shown since such can easily be written in light of the present disclosure by one of ordinary skill in the art. The computer software can be written in a variety of computer languages.

This disclosure is illustrative and not limiting; further modification will be apparent to one skilled in the art in light of this disclosure and are intended to fall within the scope of the appended claims.

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